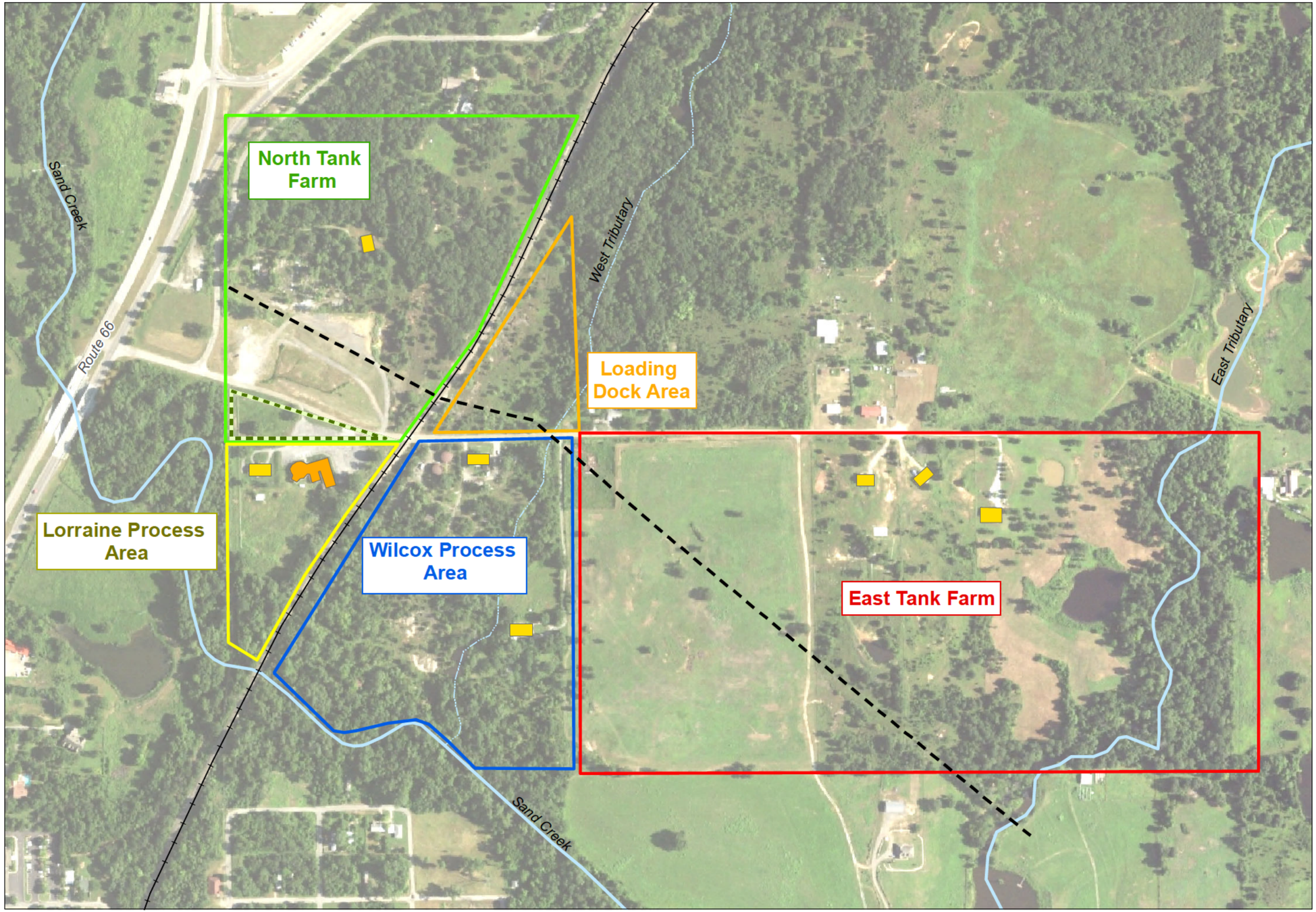
P:\gis\Projects\Wilcox\MXDs\SAP\02 SAP revised 062016\4-Site Layout.mxd 6/23/2016 EA rmullen



0 200 400 800 Feet

1 inch = 400 feet

Legend

- Stream, Intermittent
- Stream, Perennial
- Pipeline
- Railroad

On-Site Building

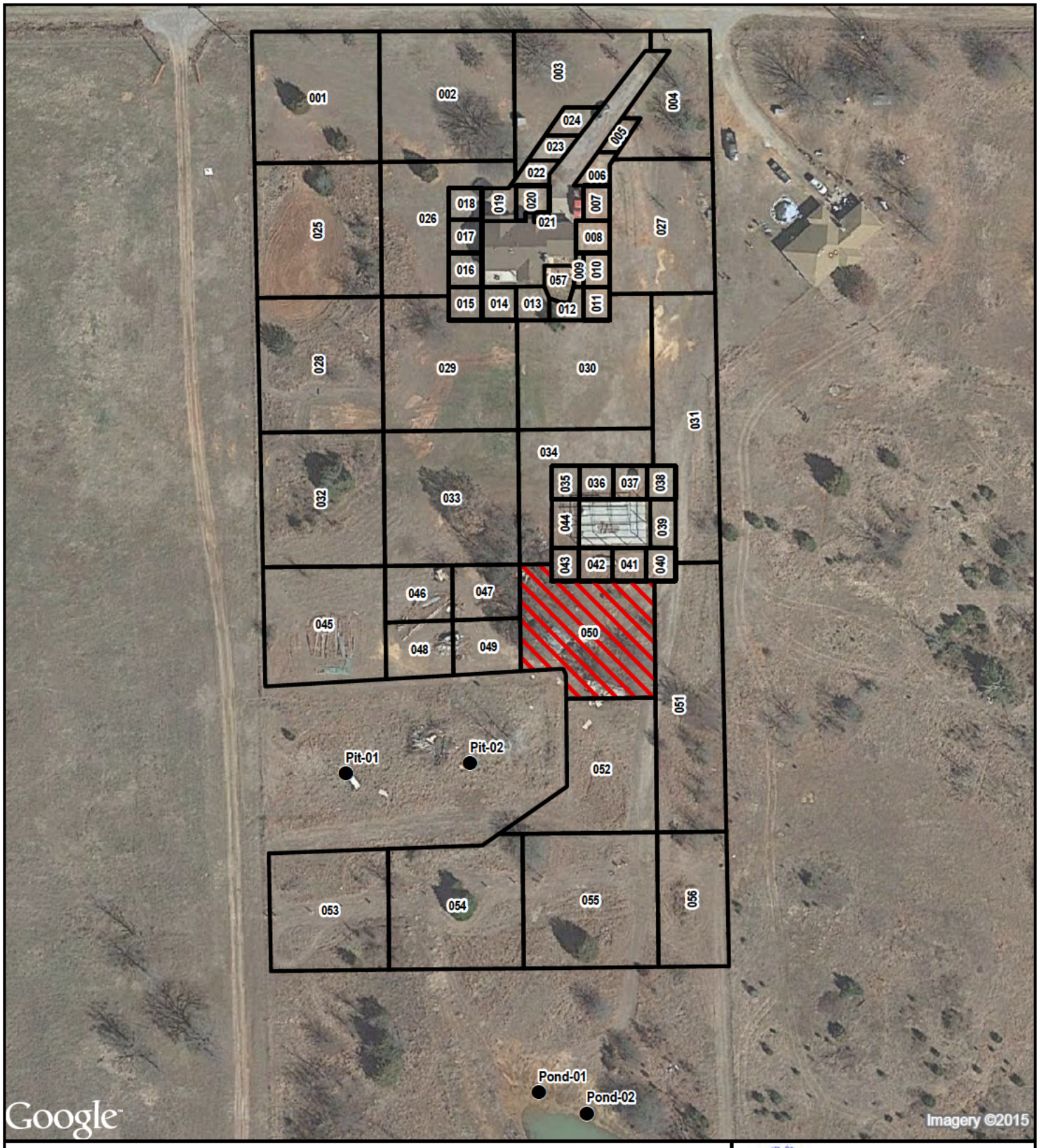
- Church
- Residence
- Area will be designated as part of Lorraine Process Area for this investigation.

Image Source: National Agriculture Imagery Program 2015.

Wilcox Oil Company Superfund Site
Bristow, Creek County, Oklahoma

9723616

FIGURE 2
SITE LAYOUT



0 100 200

Feet

LEGEND

- Grab Sample Locations

RESULTS

- Composite Sample Grid
- Grid Exceeded to 12" Depth

N

TDD NO: 5/WESTON-042-15-004

SOURCE: Google Satellite HD

US EPA REGION 6

SAMPLE RESULTS MAP
WILCOX OIL
WEST 221st STREET/REFINERY ROAD
BRISTOW, CREEK COUNTY, OKLAHOMA

DATE	PROJECT NO	SCALE
JANUARY, 2015	20406.012.005.0919.01	AS SHOWN

FILE: L:\20406_START3_R6\WILCOX_OIL\GIS\FIGURE 1 SAMPLE RESULTS MAP.mxd 7:25:34 PM 1/5/2015 lcondp

Wilcox Oil Company Superfund Site - Residential Data Results and Site Information

Wilcox Oil
Pit Characterization Sample Results Summary
Bristow, Creek County, Oklahoma

Analyte	Units	Residential Soil RSL	Pit-01 12/11/2014	Pit-02 12/11/2014
Metals				
Aluminum	mg/kg	77000	**1130**	**531**
Antimony	mg/kg	31	0.29 U	0.209 U
Arsenic	mg/kg	0.68	**3.04**	**2.2**
Barium	mg/kg	15000	**14.1**	**9.02**
Beryllium	mg/kg	160	0.193 U	0.14 U
Cadmium	mg/kg	71	**0.235 JQ**	0.0436 U
Calcium	mg/kg	NP	**980**	**619**
Chromium	mg/kg	NP	**1.84**	**1.27**
Cobalt	mg/kg	23	**1.79**	**0.568**
Copper	mg/kg	3100	**4.96**	**7.05**
Iron	mg/kg	55000	**3280**	**2100**
Lead	mg/kg	400	**23.5**	**29**
Magnesium	mg/kg	NP	**237**	**142**
Manganese	mg/kg	1800	**69.2**	**41.8**
Molybdenum	mg/kg	390	0.205 U	0.148 U
Nickel	mg/kg	1500	**7.99**	**3.22**
Potassium	mg/kg	NP	**263**	**142**
Selenium	mg/kg	390	0.482 U	0.349 U
Silver	mg/kg	390	0.193 U	0.14 U
Sodium	mg/kg	NP	**408**	**96.1**
Thallium	mg/kg	0.78	0.41 U	0.296 U
Tin	mg/kg	47000	0.603 UB	0.436 UB
Vanadium	mg/kg	390	**9.22**	**5.48**
Zinc	mg/kg	23000	**40**	**18.6**

Wilcox Oil
Pit Characterization Sample Results Summary
Bristow, Creek County, Oklahoma

Analyte	Units	Residential Soil RSL	Pit-01 12/11/2014	Pit-02 12/11/2014
SVOCs				
1,2,4-Trichlorobenzene	mg/kg	24	7.76 U	6.08 U
1,2-Dichlorobenzene	mg/kg	1800	7.63 U	5.98 U
1,3-Dichlorobenzene	mg/kg	NP	8.16 U	6.39 U
1,4-Dichlorobenzene	mg/kg	2.6	8.43 U	6.6 U
1-Methylnaphthalene	mg/kg	18	8.3 U	6.5 U
2,2'-Oxybis(1-chloropropane)	mg/kg	4.9	29.4 UJ	23.1 UJ
2,4,5-Trichlorophenol	mg/kg	6300	9.9 U	7.76 U
2,4,6-Trichlorophenol	mg/kg	49	9.1 U	7.13 U
2,4-Dichlorophenol	mg/kg	190	10 U	7.86 U
2,4-Dimethylphenol	mg/kg	1300	7.63 U	5.98 U
2,4-Dinitrophenol	mg/kg	130	29.4 U	23.1 U
2,4-Dinitrotoluene	mg/kg	1.7	6.56 U	5.14 U
2,6-Dinitrotoluene	mg/kg	0.36	6.69 U	5.24 U
2-Chloronaphthalene	mg/kg	6300	8.93 U	6.99 U
2-Chlorophenol	mg/kg	390	9.24 U	7.23 U
2-Methylnaphthalene	mg/kg	240	7.76 U	6.08 U
2-Methylphenol	mg/kg	3100	12.8 U	10.1 U
2-Nitroaniline	mg/kg	610	7.63 U	5.98 U
2-Nitrophenol	mg/kg	NP	9.64 U	7.55 U
3,3'-Dichlorobenzidine	mg/kg	1.2	7.9 U	6.18 U
3-Nitroaniline	mg/kg	NP	10.7 U	8.39 U
4,6-Dinitro-2-methylphenol	mg/kg	4.9	35.6 U	27.9 U
4-Bromophenyl-phenylether	mg/kg	NP	6.56 U	5.14 U
4-Chloro-3-methylphenol	mg/kg	6200	7.5 U	5.87 U
4-Chloroaniline	mg/kg	2.7	8.43 U	6.6 U
4-Chlorophenyl-phenylether	mg/kg	NP	6.82 U	5.35 U
4-Methylphenol	mg/kg	6200	7.9 U	6.18 U
SVOCs (Continued)				
4-Nitroaniline	mg/kg	27	11.8 U	9.22 U
4-Nitrophenol	mg/kg	NP	7.09 U	5.56 U
Acenaphthene	mg/kg	3600	6.56 U	5.14 U
Acenaphthylene	mg/kg	NP	7.36 U	5.76 U
Aniline	mg/kg	95	10.3 U	8.07 U
Anthracene	mg/kg	18000	8.03 U	**10.6 JQ**
Benzidine	mg/kg	0.00053	80.3 U	62.9 U
Benzo(a)anthracene	mg/kg	1.1	7.63 U	**18.4 JQ**
Benzo(a)pyrene	mg/kg	0.11	5.76 U	**11 JQ**
Benzo(b)fluoranthene	mg/kg	1.1	8.43 U	**14.9 JQ**
Benzo(g,h,i)perylene	mg/kg	NP	5.35 U	**12.8 JQ**
Benzo(k)fluoranthene	mg/kg	11	7.63 U	5.98 U

Wilcox Oil
Pit Characterization Sample Results Summary
Bristow, Creek County, Oklahoma

Analyte	Units	Residential Soil RSL	Pit-01 12/11/2014	Pit-02 12/11/2014
Benzoic acid	mg/kg	250000	36.1 U	28.3 U
Benzyl alcohol	mg/kg	6300	12.3 U	9.64 U
Bis(2-chloroethoxy)methane	mg/kg	190	7.63 U	5.98 U
Bis(2-chloroethyl)ether	mg/kg	0.23	8.97 U	7.02 U
Bis(2-ethylhexyl)phthalate	mg/kg	39	11.1 U	8.7 U
Butylbenzylphthalate	mg/kg	290	8.43 U	6.6 U
Chrysene	mg/kg	110	**10 JQ**	**37.5**
Dibenzo(a,h)anthracene	mg/kg	0.11	5.49 U	4.3 U
Dibenzofuran	mg/kg	73	7.23 U	5.66 U
Diethylphthalate	mg/kg	51000	6.82 U	5.35 U
Dimethylphthalate	mg/kg	NP	7.9 U	6.18 U
Di-n-butylphthalate	mg/kg	6200	5.89 U	4.61 U
Di-n-octylphthalate	mg/kg	630	7.76 U	6.08 U
Fluoranthene	mg/kg	2400	6.42 U	**18.7 JQ**
Fluorene	mg/kg	2400	6.82 U	5.35 U
SVOCs (Continued)				
Hexachlorobenzene	mg/kg	0.21	7.09 U	5.56 U
Hexachlorobutadiene	mg/kg	1.2	7.76 U	6.08 U
Hexachlorocyclopentadiene	mg/kg	1.8	20.1 U	15.7 U
Hexachloroethane	mg/kg	1.8	6.69 U	5.24 U
Indeno(1,2,3-cd)pyrene	mg/kg	1.1	6.96 U	**5.74 JQ**
Isophorone	mg/kg	570	7.9 U	6.18 U
Naphthalene	mg/kg	3.8	8.56 U	6.71 U
Nitrobenzene	mg/kg	5.1	8.03 U	6.29 U
N-Nitrosodimethylamine	mg/kg	0.0023	9.5 U	7.44 U
N-Nitroso-di-n-propylamine	mg/kg	0.078	8.16 U	6.39 U
N-Nitrosodiphenylamine	mg/kg	110	8.43 U	6.6 U
Pentachlorophenol	mg/kg	1	17.8 U	13.9 U
Phenanthrene	mg/kg	NP	7.5 U	**27.8 JQ**
Phenol	mg/kg	19000	8.7 U	6.81 U
Pyrene	mg/kg	1800	12.3 U	**196**
TPH				
TPH C28-C35	mg/kg	NP	**114000**	**108000**
TPH C6-C12	mg/kg	NP	**4180 JQ**	**2930 JQ**
TPH C6-C35	mg/kg	NP	**301000**	**284000**
VOCs				
1,1,1,2-Tetrachloroethane	mg/kg	2	0.113 U	0.0781 U
1,1,1-Trichloroethane	mg/kg	8100	0.152 U	0.106 U
1,1,2,2-Tetrachloroethane	mg/kg	0.6	0.0899 U	0.0623 U
1,1,2-Trichloroethane	mg/kg	2	0.125 U	0.0866 U
1,1-Dichloroethane	mg/kg	3.6	0.0518 U	0.0359 U

Wilcox Oil
Pit Characterization Sample Results Summary
Bristow, Creek County, Oklahoma

Analyte	Units	Residential Soil RSL	Pit-01 12/11/2014	Pit-02 12/11/2014
1,1-Dichloroethene	mg/kg	230	0.0518 U	0.0359 U
1,1-Dichloropropene	mg/kg	NP	0.0624 U	0.0433 U
VOCs (Continued)				
1,2,3-Trichlorobenzene	mg/kg	63	0.0929 U	0.0644 U
1,2,3-Trichloropropane	mg/kg	0.0051	0.183 U	0.127 U
1,2,4-Trichlorobenzene	mg/kg	24	0.096 U	0.0665 U
1,2,4-Trimethylbenzene	mg/kg	300	0.067 U	**0.621**
1,2-Dibromo-3-chloropropane	mg/kg	0.0053	0.426 U	0.296 U
1,2-Dibromoethane	mg/kg	0.036	0.125 U	0.0866 U
1,2-Dichlorobenzene	mg/kg	1800	0.0853 U	0.0591 U
1,2-Dichloroethane	mg/kg	0.46	0.152 U	0.106 U
1,2-Dichloropropane	mg/kg	2.5	0.096 U	0.0665 U
1,3,5-Trimethylbenzene	mg/kg	2200	0.0792 U	**0.161 JQ**
1,3-Dichlorobenzene	mg/kg	NP	0.0685 U	0.0475 U
1,3-Dichloropropane	mg/kg	1600	0.0822 U	0.057 U
1,4-Dichlorobenzene	mg/kg	2.6	0.099 U	0.0686 U
2,2-Dichloropropane	mg/kg	NP	0.0899 U	0.0623 U
2-Butanone	mg/kg	27000	0.213 U	0.148 U
2-Chlorotoluene	mg/kg	1600	0.0731 U	0.0507 U
2-Hexanone	mg/kg	200	0.198 U	0.137 U
4-Chlorotoluene	mg/kg	1600	0.0792 U	0.0549 U
4-Isopropyltoluene	mg/kg	NP	0.108 U	**0.14 JQ**
4-Methyl-2-pentanone	mg/kg	5300	0.244 U	0.169 U
Acetone	mg/kg	61000	**2.65**	**0.292 JQ**
Benzene	mg/kg	1.2	0.0762 U	0.0528 U
Bromobenzene	mg/kg	290	0.168 U	0.116 U
Bromochloromethane	mg/kg	150	0.137 U	0.095 U
Bromodichloromethane	mg/kg	0.29	0.0487 U	0.0338 U
Bromoform	mg/kg	19	0.0701 U	0.0486 U
Bromomethane	mg/kg	6.8	0.183 U	0.127 U
VOCs (Continued)				
Carbon disulfide	mg/kg	770	0.228 U	0.158 U
Carbon tetrachloride	mg/kg	0.65	0.0914 U	0.0633 U
Chlorobenzene	mg/kg	280	0.0533 U	0.037 U
Chloroethane	mg/kg	14000	0.113 U	0.0781 U
Chloroform	mg/kg	0.32	0.0822 U	0.057 U
Chloromethane	mg/kg	110	0.0579 U	0.0401 U
cis-1,2-Dichloroethene	mg/kg	160	0.0944 U	0.0654 U
cis-1,3-Dichloropropene	mg/kg	NP	0.064 U	0.0443 U
Dibromochloromethane	mg/kg	8.3	0.0701 U	0.0486 U
Dibromomethane	mg/kg	24	0.1 U	0.0697 U

Wilcox Oil
Pit Characterization Sample Results Summary
Bristow, Creek County, Oklahoma

Analyte	Units	Residential Soil RSL	Pit-01 12/11/2014	Pit-02 12/11/2014
Dichlorodifluoromethane	mg/kg	87	0.0914 U	0.0633 U
Ethylbenzene	mg/kg	5.8	0.105 U	0.0728 U
Hexachlorobutadiene	mg/kg	1.2	0.183 U	0.127 U
Isopropylbenzene	mg/kg	1900	0.0914 U	**0.132 JQ**
m,p-Xylene	mg/kg	NP	0.104 U	**0.189 JQ**
Methyl iodide	mg/kg	NP	0.228 U	0.158 U
Methyl tert-butyl ether	mg/kg	47	0.0655 U	0.0454 U
Methylene chloride	mg/kg	57	0.183 U	0.127 U
Naphthalene	mg/kg	3.8	0.228 U	**0.887**
n-Butylbenzene	mg/kg	3900	**0.101 JQ**	**0.192 JQ**
n-Propylbenzene	mg/kg	3800	0.104 U	**0.124 JQ**
o-Xylene	mg/kg	650	0.0533 U	0.037 U
sec-Butylbenzene	mg/kg	7800	**0.064 JQ**	**0.152 JQ**
Styrene	mg/kg	6000	0.0426 U	0.0296 U
tert-Butylbenzene	mg/kg	7800	0.104 U	0.0718 U
Tetrachloroethene	mg/kg	24	0.142 U	0.0982 U
Toluene	mg/kg	4900	0.0442 U	0.0306 U
VOCs (Continued)				
trans-1,2-Dichloroethene	mg/kg	1600	0.0594 U	0.0412 U
trans-1,3-Dichloropropene	mg/kg	NP	0.152 U	0.106 U
Trichloroethene	mg/kg	0.94	0.067 U	0.0464 U
Trichlorofluoromethane	mg/kg	23000	0.067 U	0.0464 U
Vinyl acetate	mg/kg	910	0.228 U	0.158 U
Vinyl chloride	mg/kg	0.059	0.0914 U	0.0633 U
Xylene (total)	mg/kg	580	0.104 U	**0.219 JQ**

Notes:
Screening levels are EPA RSLs with HI=1.0
Bold values are detected concentrations below the screening level.
Bold and highlighted values are detected concentrations above the screening level.

Wilcox Oil
Soil Analytical Results Summary
Bristow, Creek County, Oklahoma

	Analyte	Lead
	Units	mg/kg
	Residential Soil RSL	400
	Industrial Soil RSL	800
Sample ID	**Date**	**--**
Pond-01	12/11/2014	**5.51**
Pond-02	12/11/2014	**2.98**
WO-001-001-00-51	12/9/2014	**19.6 J**
WO-001-001-06-51	12/10/2014	**15**
WO-001-001-12-51	12/10/2014	**8.84**
WO-001-002-00-51	12/9/2014	**8.18 J**
WO-001-002-06-51	12/10/2014	**9.1**
WO-001-002-12-51	12/10/2014	**5.82**
WO-001-003-00-51	12/9/2014	**8.15**
WO-001-003-06-51	12/10/2014	**8.74**
WO-001-003-12-51	12/10/2014	**4.65**
WO-001-004-00-51	12/9/2014	**9.16**
WO-001-004-06-51	12/10/2014	**14.6**
WO-001-004-06-52	12/10/2014	**14.2**
WO-001-004-12-51	12/10/2014	**4.94**
WO-001-005-00-51	12/9/2014	**12.3**
WO-001-005-06-51	12/9/2014	**9.11**
WO-001-005-12-51	12/9/2014	**7.16**
WO-001-006-00-51	12/9/2014	**15.7**
WO-001-006-06-51	12/9/2014	**12.9**
WO-001-006-12-51	12/9/2014	**6.02**
WO-001-007-00-51	12/9/2014	**7.4**
WO-001-007-06-51	12/9/2014	**4.23**
WO-001-007-12-51	12/9/2014	**4.74**
WO-001-008-00-51	12/9/2014	**7.15**
WO-001-008-00-52	12/9/2014	**7.27**
WO-001-008-06-51	12/9/2014	**6**
WO-001-008-12-51	12/9/2014	**6.95**
WO-001-009-00-51	12/9/2014	**6.86**
WO-001-009-06-51	12/9/2014	**9.68**
WO-001-009-12-51	12/9/2014	**7.77**
WO-001-010-00-51	12/9/2014	**7.38**
WO-001-010-06-51	12/9/2014	**6.62**
WO-001-010-12-51	12/9/2014	**6.64**
WO-001-010-12-52	12/9/2014	**8.95**
WO-001-011-00-51	12/9/2014	**5.44**
WO-001-011-06-51	12/9/2014	**10.1**
WO-001-011-12-51	12/9/2014	**14.1**

Wilcox Oil
Soil Analytical Results Summary
Bristow, Creek County, Oklahoma

	Analyte	Lead
	Units	mg/kg
	Residential Soil RSL	400
	Industrial Soil RSL	800
Sample ID	**Date**	**--**
WO-001-012-00-51	12/9/2014	**7.97**
WO-001-012-06-51	12/9/2014	**6.03**
WO-001-012-12-51	12/9/2014	**4.51**
WO-001-013-00-51	12/9/2014	**8.09**
WO-001-013-06-51	12/9/2014	**6.26**
WO-001-014-00-51	12/9/2014	**6.95**
WO-001-014-06-51	12/9/2014	**7**
WO-001-014-12-51	12/9/2014	**8.92**
WO-001-015-00-51	12/9/2014	**6.87**
WO-001-015-06-51	12/9/2014	**5.63**
WO-001-015-06-52	12/9/2014	**5.62**
WO-001-015-12-51	12/9/2014	**3.6**
WO-001-016-00-51	12/9/2014	**7.66 J**
WO-001-016-00-52	12/9/2014	**7.04 J**
WO-001-016-06-51	12/9/2014	**8**
WO-001-016-12-51	12/9/2014	**8.16**
WO-001-017-00-51	12/9/2014	**7.03 J**
WO-001-017-06-51	12/9/2014	**7.14**
WO-001-017-12-51	12/9/2014	**10.1**
WO-001-018-00-51	12/9/2014	**8.13 J**
WO-001-018-06-51	12/9/2014	**6.94**
WO-001-018-12-51	12/9/2014	**18.3**
WO-001-019-00-51	12/9/2014	**7.29**
WO-001-019-06-51	12/9/2014	**5.86**
WO-001-019-12-51	12/9/2014	**6.46**
WO-001-020-00-51	12/9/2014	**6.11**
WO-001-020-00-52	12/9/2014	**6.21**
WO-001-020-06-51	12/9/2014	**8.76**
WO-001-020-12-51	12/9/2014	**4.24**
WO-001-020-12-52	12/9/2014	**6.15**
WO-001-021-00-51	12/9/2014	**5.48**
WO-001-022-00-51	12/9/2014	**11.4**
WO-001-022-06-51	12/9/2014	**6.17**
WO-001-022-12-51	12/9/2014	**6.68**
WO-001-023-00-51	12/9/2014	**13.8**
WO-001-023-06-51	12/9/2014	**3.72**
WO-001-023-06-52	12/9/2014	**4.14**
WO-001-023-12-51	12/9/2014	**1.74**

Wilcox Oil
Soil Analytical Results Summary
Bristow, Creek County, Oklahoma

	Analyte	Lead
	Units	mg/kg
	Residential Soil RSL	400
	Industrial Soil RSL	800
Sample ID	**Date**	**--**
WO-001-024-00-51	12/9/2014	**8.7**
WO-001-024-06-51	12/9/2014	**4.97**
WO-001-024-12-51	12/9/2014	**4**
WO-001-025-00-51	12/9/2014	**113 J**
WO-001-025-06-51	12/10/2014	**15.6**
WO-001-025-12-51	12/10/2014	**9.6**
WO-001-026-00-51	12/9/2014	**10.7 J**
WO-001-026-06-51	12/10/2014	**6.97**
WO-001-026-12-51	12/10/2014	**7.5**
WO-001-027-00-51	12/9/2014	**9.67**
WO-001-027-06-51	12/10/2014	**13.8**
WO-001-027-12-51	12/10/2014	**5.37**
WO-001-028-00-51	12/9/2014	**46.3 J**
WO-001-028-00-52	12/9/2014	**38.3 J**
WO-001-028-06-51	12/10/2014	**19.5**
WO-001-028-12-51	12/10/2014	**10.7 J**
WO-001-028-12-52	12/10/2014	**23 J**
WO-001-029-00-51	12/9/2014	**7.55 J**
WO-001-029-06-51	12/10/2014	**5.88**
WO-001-029-12-51	12/10/2014	**3.97**
WO-001-030-00-51	12/9/2014	**8.89 J**
WO-001-030-06-51	12/10/2014	**6.54**
WO-001-030-12-51	12/10/2014	**13.6**
WO-001-031-00-51	12/9/2014	**21.2 J**
WO-001-031-06-51	12/10/2014	**12.1**
WO-001-031-12-51	12/10/2014	**14.1**
WO-001-032-00-51	12/9/2014	**7.04 J**
WO-001-032-06-51	12/10/2014	**11**
WO-001-032-12-51	12/10/2014	**7.34**
WO-001-033-00-51	12/9/2014	**9.52 J**
WO-001-033-06-51	12/10/2014	**9.32**
WO-001-033-06-52	12/10/2014	**10.5**
WO-001-033-12-51	12/10/2014	**4.35**
WO-001-034-00-51	12/9/2014	**16.8 J**
WO-001-035-00-51	12/9/2014	**14.8**
WO-001-035-06-51	12/10/2014	**9.1**
WO-001-035-06-52	12/10/2014	**9.96**
WO-001-035-12-51	12/10/2014	**7.54**

Wilcox Oil
Soil Analytical Results Summary
Bristow, Creek County, Oklahoma

	Analyte	Lead
	Units	mg/kg
	Residential Soil RSL	400
	Industrial Soil RSL	800
Sample ID	**Date**	**--**
WO-001-036-00-51	12/9/2014	**12.6**
WO-001-036-06-51	12/10/2014	**8.96**
WO-001-036-12-51	12/10/2014	**5.04**
WO-001-037-00-51	12/9/2014	**19**
WO-001-037-06-51	12/10/2014	**9.67**
WO-001-037-12-51	12/10/2014	**8.25**
WO-001-038-00-51	12/9/2014	**14.5**
WO-001-038-06-51	12/10/2014	**15.8**
WO-001-038-12-51	12/10/2014	**5.87**
WO-001-039-00-51	12/9/2014	**16**
WO-001-039-00-52	12/9/2014	**12.6**
WO-001-039-06-51	12/10/2014	**8.57**
WO-001-039-12-51	12/10/2014	**0.766**
WO-001-040-00-51	12/9/2014	**13.5**
WO-001-040-06-51	12/10/2014	**17.4**
WO-001-040-12-51	12/10/2014	**7.99**
WO-001-041-00-51	12/9/2014	**16.5**
WO-001-041-06-51	12/10/2014	**12.1**
WO-001-041-12-51	12/10/2014	**6.17**
WO-001-042-00-51	12/9/2014	**16.2**
WO-001-042-06-51	12/10/2014	**12.2**
WO-001-042-12-51	12/10/2014	**10.7**
WO-001-043-00-51	12/9/2014	**21.9**
WO-001-043-06-51	12/10/2014	**13.9**
WO-001-043-12-51	12/10/2014	**11.1**
WO-001-044-00-51	12/9/2014	**15.6**
WO-001-044-06-51	12/10/2014	**6.24**
WO-001-044-12-51	12/10/2014	**6.77**
WO-001-045-00-51	12/9/2014	**13.1 J**
WO-001-045-06-51	12/10/2014	**6.65**
WO-001-045-12-51	12/10/2014	**8.41**
WO-001-046-00-51	12/9/2014	**15.8 J**
WO-001-046-06-51	12/10/2014	**14.7**
WO-001-046-12-51	12/10/2014	**4.64**
WO-001-047-00-51	12/9/2014	**27.8 J**
WO-001-047-06-51	12/10/2014	**34.2**
WO-001-047-12-51	12/10/2014	**5.02**
WO-001-048-00-51	12/9/2014	**11.6 J**

Wilcox Oil
Soil Analytical Results Summary
Bristow, Creek County, Oklahoma

	Analyte	Lead
	Units	mg/kg
	Residential Soil RSL	400
	Industrial Soil RSL	800
Sample ID	**Date**	**--**
WO-001-048-06-51	12/10/2014	**7.48**
WO-001-048-12-51	12/10/2014	**6.9**
WO-001-049-00-51	12/9/2014	**99.6**
WO-001-049-06-51	12/10/2014	**47**
WO-001-049-12-51	12/10/2014	**24.5**
WO-001-049-12-52	12/10/2014	**35.1**
WO-001-050-00-51	12/9/2014	**181**
WO-001-050-06-51	12/10/2014	**906**
WO-001-050-12-51	12/10/2014	**5850**
WO-001-051-00-51	12/9/2014	**12.3**
WO-001-051-06-51	12/10/2014	**8.88**
WO-001-051-12-51	12/10/2014	**10.9**
WO-001-052-00-51	12/9/2014	**11.2**
WO-001-052-06-51	12/10/2014	**8.77**
WO-001-052-12-51	12/10/2014	**4.68**
WO-001-053-00-51	12/9/2014	**7.9**
WO-001-053-06-51	12/10/2014	**6.33**
WO-001-053-12-51	12/10/2014	**7.94**
WO-001-054-00-51	12/9/2014	**11.1**
WO-001-054-06-51	12/10/2014	**10.4**
WO-001-054-12-51	12/10/2014	**4.26**
WO-001-055-00-51	12/9/2014	**8.55**
WO-001-055-06-51	12/10/2014	**10.8**
WO-001-055-12-51	12/10/2014	**4.81**
WO-001-056-00-51	12/9/2014	**14.1**
WO-001-056-00-52	12/9/2014	**10.6**
WO-001-056-06-51	12/10/2014	**11.5**
WO-001-056-12-51	12/10/2014	**5.65**
WO-001-057-00-51	12/10/2014	**9.16**
WO-001-057-06-51	12/10/2014	**7.32**
WO-001-057-12-51	12/10/2014	**6.67**

Notes:

Screening levels are EPA RSLs with HI=1.0

Bold values are detected concentrations below the screening level.

Bold and highlighted values are detected concentrations above the screening level.

SCOTT THOMPSON
EXECUTIVE DIRECTOR

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

MARY FALLIN
GOVERNOR

January 26, 2014

(b) (6)
[redacted]

Dear Mr. ,

The Oklahoma Department of Environmental Quality (DEQ) sampled water from your house well on December 18th, 2014 as part of a reoccurring sampling event that will be performed approximately every three months. DEQ has offered this sampling to residents that live on, or adjacent to the Wilcox Oil Company Superfund Site. You are receiving this letter because you have provided DEQ permission to enter your property and collect a water sample from your well.

DEQ sampled for three types of contaminants that can be found on historical refinery locations. Those are: Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs) and Metals.

The first two pages of the sampling data is for VOCs. Results of the sampling are located in the Results column. The "<" symbol indicates that the substance was not detected in the sample. The next six pages are for SVOCs, and the last two pages for Metals. The "<" symbol in the Qualifier column indicates that the substance was not detected. No VOC or SVOC chemicals were detected in the water sample from your well. Several metals were detected at normal levels and are not considered to be a health risk.

The purpose of this sampling event was not to fully define the extent or type of contamination that may be present on the Wilcox Site. All potential health risks from the Site are unknown at this time. Further soil, sediment, surface water and ground water testing will be required in the future to determine how best to clean up the Wilcox Site.

If you have questions about this letter or the sampling data, do not hesitate to call me at (405) 702-5136. Please contact Bart Canellas with the U.S. Environmental Protection Agency at (214) 665-6662 with any questions about the EPA Superfund process or plans for the Wilcox Site.

W. Todd Downham

Todd Downham
Project Manager, Wilcox Oil Company Superfund Site
Land Protection Division
Oklahoma Department of Environmental Quality

c. Bart Canellas, U.S. EPA Dallas

State Environmental Laboratory Services Division

EPA DRINKING WATER CERTIFICATION #OK00013

General Inquiries: 1-866-412-3057

SAMPLE INFORMATION

Sample Number: 051909.006
Description: WR-6; LANE

Collected By: TD
Collected: 12/18/14 11:35 am
Received: 12/18/14 4:12 pm

TEST RESULTS

Analysis: Volatile Organic Compounds **Analysis Method:** EPA 524.3

Component Name	Result	Unit	Qualifiers	Analyst	Analysis Date
1,1,1-Trichloroethane	<0.5	µg/L		HLR	12/19/14
1,1,2-Trichloroethane	<0.5	µg/L		HLR	12/19/14
1,1-Dichloroethene	<0.5	µg/L		HLR	12/19/14
1,2,4-Trichlorobenzene	<0.5	µg/L		HLR	12/19/14
1,2-Dichlorobenzene	<0.5	µg/L		HLR	12/19/14
1,2-Dichloroethane	<0.5	µg/L		HLR	12/19/14
1,2-Dichloropropane	<0.5	µg/L		HLR	12/19/14
1,4-Dichlorobenzene	<0.5	µg/L		HLR	12/19/14
Benzene	<0.5	µg/L		HLR	12/19/14
Carbon Tetrachloride	<0.5	µg/L		HLR	12/19/14
Chlorobenzene	<0.5	µg/L		HLR	12/19/14
cis-1,2-Dichloroethene	<0.5	µg/L		HLR	12/19/14
Ethylbenzene	<0.5	µg/L		HLR	12/19/14
Methyl tert-Butyl Ether (MtBE)	<0.5	µg/L		HLR	12/19/14
Methylene Chloride	<0.5	µg/L		HLR	12/19/14
Styrene	<0.5	µg/L		HLR	12/19/14
Tetrachloroethene	<0.5	µg/L		HLR	12/19/14
Toluene	<0.5	µg/L		HLR	12/19/14
trans-1,2-Dichloroethene	<0.5	µg/L		HLR	12/19/14
Trichloroethene	<0.5	µg/L		HLR	12/19/14
Vinyl Chloride	<0.5	µg/L		HLR	12/19/14
Xylenes	<0.5	µg/L		HLR	12/19/14

Sample Number: 541687
Project Code: SW-WE
Agency Number:
Date Collected: 12/18/2014
Time Collected: 1135
Date Received: 12/18/2014
Date Completed: 01/08/2015
Collected By: TD
PWS Id:
Location Code:
Station:
Facility:
Report Date: 1/8/2015

To: TODD DOWNHAM/LPD

CC: FILE COPY

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
OKLAHOMA, 73102-6010
General Inquiries: 1-866-412-3057
or selsd@deq.ok.gov

Report of Analysis by GCMS

EPA Drinking Water Certification #OK00013

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Dilution Factor, Extractab		1.03				
Acenaphthylene	<	20.6	UG/L	01/06/15	8270D	
Acenaphthene	<	20.6	UG/L	01/06/15	8270D	
Anthracene	<	20.6	UG/L	01/06/15	8270D	
Benzo(b)fluoranthene	<	20.6	UG/L	01/06/15	8270D	
Benzo(k)fluoranthene	<	20.6	UG/L	01/06/15	8270D	
Benzo(a)pyrene	<	20.6	UG/L	01/06/15	8270D	
Bis(2-chloroethyl)ether	<	20.6	UG/L	01/06/15	8270D	
Bis(2-chloroethoxy)methane	<	20.6	UG/L	01/06/15	8270D	
Bis(2-chloroisopropyl)ethe	<	20.6	UG/L	01/06/15	8270D	
Butylbenzylphthalate	<	20.6	UG/L	01/06/15	8270D	
Chrysene	<	20.6	UG/L	01/06/15	8270D	
Diethylphthalate	<	20.6	UG/L	01/06/15	8270D	
Dimethylphthalate	<	20.6	UG/L	01/06/15	8270D	
Fluoranthene	<	20.6	UG/L	01/06/15	8270D	
Fluorene	<	20.6	UG/L	01/06/15	8270D	
Hexachlorocyclopentadiene	<	20.6	UG/L	01/06/15	8270D	
Hexachloroethane in water	<	20.6	UG/L	01/06/15	8270D	
Indeno(123cd)pyrene	<	20.6	UG/L	01/06/15	8270D	
Isophorone	<	20.6	UG/L	01/06/15	8270D	
Nitrosodipropylamine	<	20.6	UG/L	01/06/15	8270D	
Nitrosodiphenylamine	<	20.6	UG/L	01/06/15	8270D	
Nitrobenzene	<	20.6	UG/L	01/06/15	8270D	
p-Chloro-m-cresol	<	20.6	UG/L	01/06/15	8270D	
Phenanthrene	<	20.6	UG/L	01/06/15	8270D	
Pyrene	<	20.6	UG/L	01/06/15	8270D	
Benzo(ghi)perylene	<	20.6	UG/L	01/06/15	8270D	
Benzo(a)anthracene	<	20.6	UG/L	01/06/15	8270D	
1,2,4-Trichlorobenzene	<	20.6	UG/L	01/06/15	8270D	
Dibenzo(ah)anthracene	<	20.6	UG/L	01/06/15	8270D	
1,4-Dichlorobenzene	<	20.6	UG/L	01/06/15	8270D	
2-Chloronaphthalene	<	20.6	UG/L	01/06/15	8270D	
2-Chlorophenol	<	20.6	UG/L	01/06/15	8270D	

Sample Number: 541687
Project Code: SW-WE
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Report of Analysis by GCMS

EPA Drinking Water Certification #OK00013

To: TODD DOWNHAM/LPD

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Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
2-Nitrophenol	<	20.6	UG/L	01/06/15	8270D	
Di-n-octylphthalate	<	20.6	UG/L	01/06/15	8270D	
2,4-Dichlorophenol	<	20.6	UG/L	01/06/15	8270D	
2,4-Dimethylphenol	<	20.6	UG/L	01/06/15	8270D	
2,4-Dinitrotoluene	<	20.6	UG/L	01/06/15	8270D	
2,4-Dinitrophenol	<	51.5	UG/L	01/06/15	8270D	
2,4,6-Trichlorophenol	<	20.6	UG/L	01/06/15	8270D	
2,6-Dinitrotoluene	<	20.6	UG/L	01/06/15	8270D	
3,3'-Dichlorobenzidine	<	20.6	UG/L	01/06/15	8270D	
4-Bromophenylphenyl ether	<	20.6	UG/L	01/06/15	8270D	
4-Chlorophenyl phenylether	<	20.6	UG/L	01/06/15	8270D	
4-Nitrophenol	<	51.5	UG/L	01/06/15	8270D	
4,6-Dinitro-o-cresol	<	51.5	UG/L	01/06/15	8270D	
Phenol	<	20.6	UG/L	01/06/15	8270D	
Naphthalene	<	20.6	UG/L	01/06/15	8270D	
Pentachlorophenol	<	51.5	UG/L	01/06/15	8270D	
Bis(2-ethylhexyl)phthalate	<	20.6	UG/L	01/06/15	8270D	
Di-n-butylphthalate	<	20.6	UG/L	01/06/15	8270D	
Hexachlorobenzene	<	20.6	UG/L	01/06/15	8270D	
Hexachlorobutadiene	<	20.6	UG/L	01/06/15	8270D	
Dibenzofuran	<	20.6	UG/L	01/06/15	8270D	
2-Methylnaphthalene	<	20.6	UG/L	01/06/15	8270D	
2-Methylphenol	<	20.6	UG/L	01/06/15	8270D	
4-Methylphenol	<	20.6	UG/L	01/06/15	8270D	
2,4,5-Trichlorophenol	<	20.6	UG/L	01/06/15	8270D	
4-Chloroaniline	<	20.6	UG/L	01/06/15	8270D	
2-Nitroaniline	<	51.5	UG/L	01/06/15	8270D	
3-Nitroaniline	<	51.5	UG/L	01/06/15	8270D	
4-Nitroaniline	<	51.5	UG/L	01/06/15	8270D	

SURROGATE RECOVERIES

COMPOUND	RECOVERY %
PHENOL-D5	18
2-FLUOROBIPHENYL	56

Sample Number: 541687
Project Code: SW-WE
Agency Number:
Date Collected: 12/18/2014
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Report of Analysis by GCMS

EPA Drinking Water Certification #OK00013

To: TODD DOWNHAM/LPD CC: FILE COPY

SURROGATE RECOVERIES	
COMPOUND	RECOVERY %
P-TERPHENYL-D14	80
2-FLUOROPHENOL	23
2,4,6-TRIBROMOPHENOL	70
NITROBENZENE-D5	51

COMPOUND	TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH	VALUE	UNITS
1,2-Benzenedicarboxylic acid, d		131	ug/L

Summary

Labs performing analysis on this Sample:
Metals GCMS

SOURCE: WILCOX

SAMPLERS COMMENTS:
WR-6;LANE

SAMPLE RECEIVING COMMENTS:
ICE; SAMPLE= 3.4

ANALYST`S COMMENTS:
Olivia Pierce (8270DM),(NJ) The analysis indicates the presence of one or more compounds that have been 'tentatively identified,' and the associated numerical values represent their approximate concentrations.

* * ANALYST _____

Sample Number: 541687
Project Code: SW-WE
Agency Number:
Date Collected: 12/18/2014
Time Collected: 1135
Date Received: 12/18/2014
Date Completed: 01/09/2015
Collected By: TD
PWS Id:
Location Code:
Station:
Facility:
Report Date: 1/9/2015

To: TODD DOWNHAM/LPD CC: FILE COPY

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
STATE ENVIRONMENTAL LABORATORY
707 N. ROBINSON
OKLAHOMA CITY
OKLAHOMA, 73102-6010
General Inquiries: 1-866-412-3057
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Report of Analysis by Metals

EPA Drinking Water Certification #OK00013

Name	Qualifier	Value	Units	Analyzed	Method	Prep Type
Arsenic, Total	<	2.00	UG/L	12/31/14	200.8	
Barium, Total		59.1	UG/L	12/31/14	200.8	
Beryllium, Total	<	2.00	UG/L	12/31/14	200.8	
Cadmium, Total	<	2.00	UG/L	12/31/14	200.8	
Chromium, Total		5.20	UG/L	12/31/14	200.8	
Copper, Total	<	5.00	UG/L	12/31/14	200.8	
Lead, Total	<	5.00	UG/L	12/31/14	200.8	
Thallium, Total	<	1.00	UG/L	12/31/14	200.8	
Nickel, Total	<	10.0	UG/L	12/31/14	200.8	
Silver, Total	<	10.0	UG/L	12/31/14	200.8	
Zinc, Total		18.7	UG/L	12/31/14	200.8	
Antimony, Total	<	2.00	UG/L	01/08/15	200.8	
Selenium, Total	<	10.0	UG/L	12/31/14	200.8	
Mercury, Total	<	0.05	UG/L	01/06/15	200.8	

Summary

Labs performing analysis on this Sample:

Metals GCMS

SOURCE: WILCOX

SAMPLERS COMMENTS:
WR-6;LANE

SAMPLE RECEIVING COMMENTS:
ICE; SAMPLE= 3.4

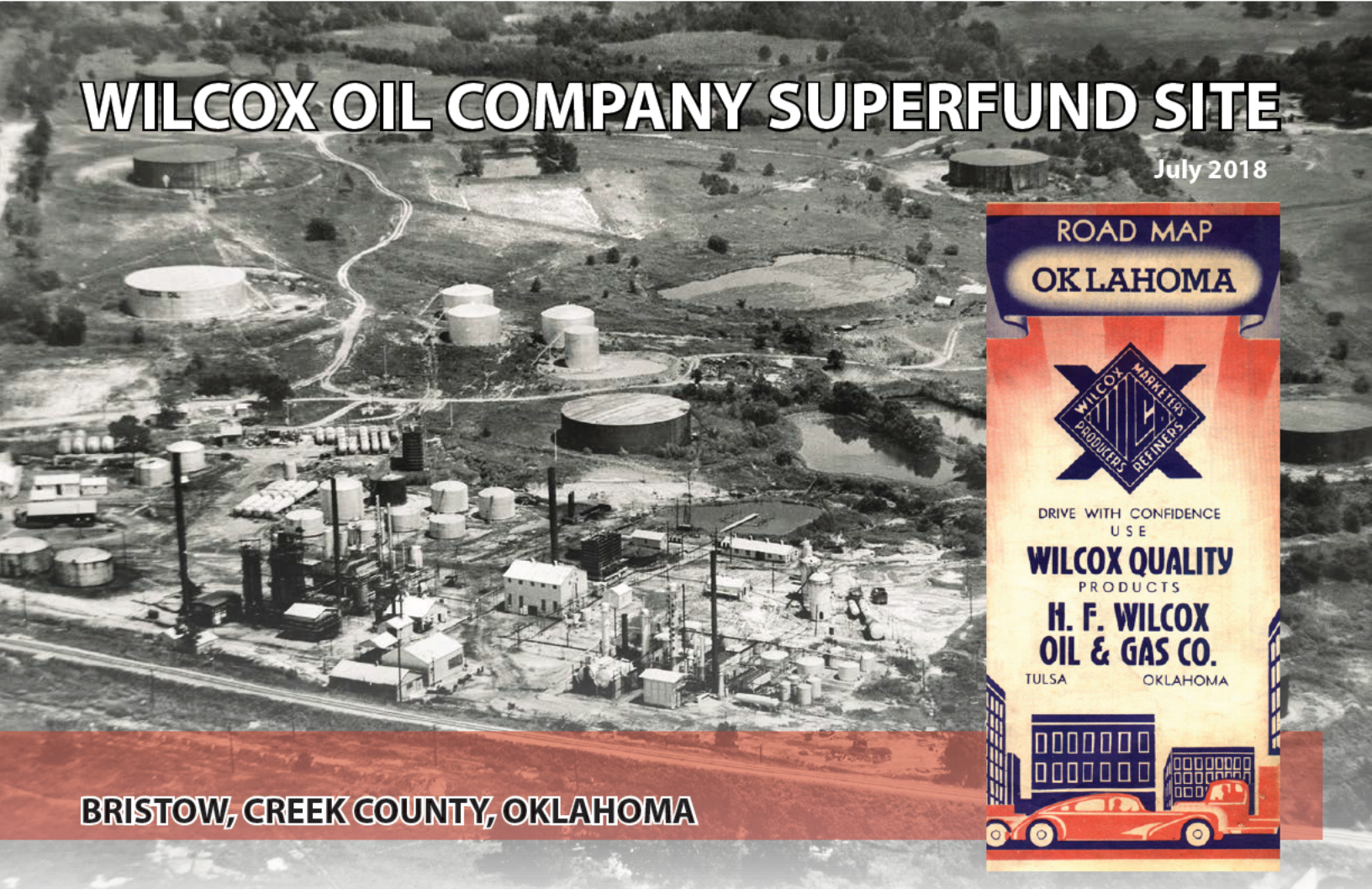
ANALYST'S COMMENTS:

* * **ANALYST** Greg Goode

Greg Goode
State Environmental Laboratory

WILCOX OIL COMPANY SUPERFUND SITE

July 2018



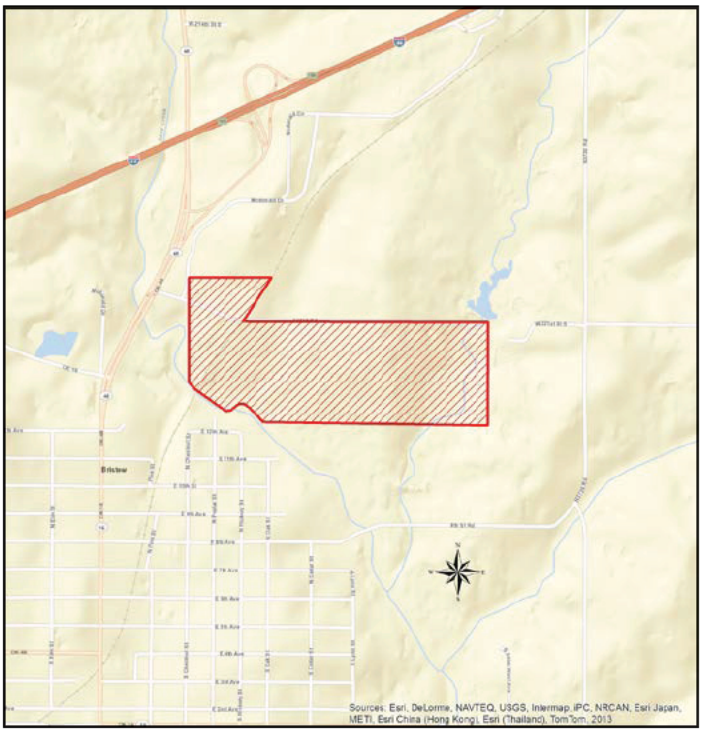
BRISTOW, CREEK COUNTY, OKLAHOMA

Under the federal Superfund program, the U.S. Environmental Protection Agency (EPA) and the Oklahoma Department of Environmental Quality (DEQ) are working to address contamination at the Wilcox Oil Company Superfund site in Bristow, Oklahoma. This is one in a series of site updates you will receive from EPA and DEQ as cleanup efforts progress.

SITE LOCATION AND HISTORY

The site consists of the former Lorraine/Wilcox Refinery located near Bristow, Oklahoma. The site was utilized by two different refineries with overlapping boundaries from 1915 to 1963. Wilcox operated as a crude oil refinery from the 1920s until 1963. A skimming and cracking plant was constructed in 1929. The main components of the plant consisted of skimming plant, cracking unit, and re-distillation battery with vapor recovery system and treatment equipment.

Wilcox expanded when it acquired the Lorraine Refinery in 1937, which was located adjacent to Wilcox. The two refineries compromise approximately 150 acres. The site includes remnants of former oil refining operations and tank farms.



Wilcox Superfund Site boundry

Multiple sampling events have been conducted by DEQ at the request of EPA Region 6. Preliminary Assessment (PA), Site Inspection (SI), and Expanded Site Inspection (ESI) have been performed at both facilities, along with other investigations performed by EPA.

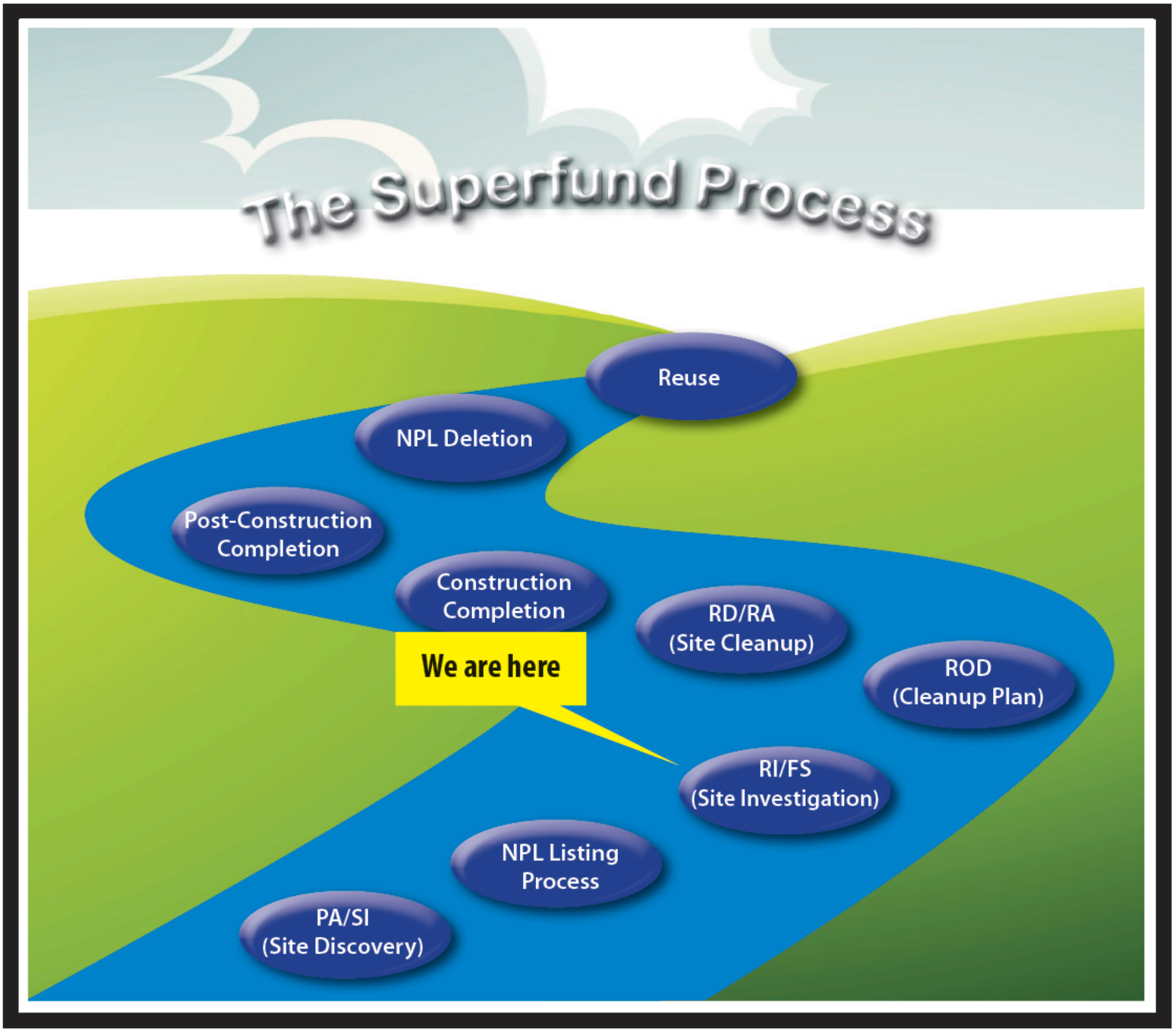
On May 24, 2013, EPA proposed the Wilcox Oil Company site to the National Priorities List (NPL a.k.a Superfund Sites) list.

On December 12, 2013, The Wilcox Oil Company site officially became a Superfund Site (EPA ID# OK0001010917), when it was added to the NPL.

WHAT IS SUPERFUND?

Superfund is the federal government's program to clean up the nation's uncontrolled hazardous waste sites.

- The Superfund Program was established by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980. CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA) in 1986 and the Small Business Liability Relief and Brownfields Revitalization Act of 2002.
- CERCLA is the law that allows EPA to clean up contaminated sites and to compel responsible parties to perform cleanups or reimburse the government for EPA-funded cleanups.



NEXT STEPS

After a site is listed on the NPL, a Remedial Investigation/Feasibility Study (RI/FS) is performed at the site.

The Remedial Investigation (RI) involves collecting environmental samples from the site to determine the extent of contamination. The RI report includes Human Health and Ecological Risk Assessments. The risk assessments evaluate potential risks to people and the environment from exposure to contaminants at the site.

Once the site is understood in terms of contamination and the risks posed, the next step is to evaluate technologies to clean-up the site. This step is called the Feasibility Study (FS). This study considers available clean-up technologies and then uses a detailed analysis to decide the best way to address the risks and clean-up the site. The best approach will then be assembled in a draft Proposed Plan which will be available for public review and comment. This will be followed by the selection of a remedy for the site. Once funded, the process will take 2 to 3 years to complete.

STEPS TO PREVENT EXPOSURE TO CONTAMINATION ON THE SITE

For those people living, working or visiting the site, it is important not to introduce contamination into homes. If you have reason to be on the Wilcox site, the following are some recommendations to limit/reduce exposure to contamination on the site. The concern about exposure is limited to the areas on the site where contamination is present:

- Ensure proper hygiene, especially frequent hand washing and rinsing outside toys
- Avoid/restrict access to exposed areas of visible oily waste
- Reduce exposure to bare soil in accessible areas
- Plant ground cover or shrubbery to reduce exposure to bare soil
- Keep fruit and vegetable gardens away from oily sludge areas
- Use gloves to avoid direct contact with soils
- Soil should be thoroughly shaken off clothes and footwear, before entering homes
- Keep and use a doormat or brush for footwear outside outer doors
- Construct raised beds filled with purchased soil for vegetable gardening
- Rinse and launder gardening clothing promptly to avoid bringing contaminated soil into the home
- Wash floors and vacuum carpets regularly
- Test home for lead paint
- Participate in child blood lead test programs with the county Health Department

If you have any health concerns related to the Wilcox Oil Company Superfund Site, contact Monty Elder at the DEQ at (405) 702-9132. Please reference the Wilcox Oil Company Superfund site when calling.

If you would like to be placed on a mailing list for site updates, please contact:

PUBLIC INVOLVEMENT OPPORTUNITIES

One of DEQ's and EPA's goals for site cleanup is to continue reaching out to the citizens of Bristow and ensuring opportunities for public involvement in the decision making process. Your input is important to us. We will continue to update you about each step in the Superfund process through periodic fact sheets and informational open houses.

DEQ and EPA will write a Community Involvement Plan (CIP) which will be made available at the site information repository in the Bristow Library. Project documents will be placed in the Bristow library and on the DEQ website throughout the Superfund process.

SITE INFORMATION RESOURCES

KATRINA HIGGINS-COLTRAIN,
REMEDIAL PROJECT MANAGER
U.S. EPA Region 6, LA/OK/NM Section
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-8143
E-Mail: Coltrain.Katrina@epa.gov

TODD DOWNHAM, PROJECT MANAGER
Oklahoma Department of Environmental Quality
707 N. Robinson, PO Box 1677
Oklahoma City, Oklahoma 73101-1677
(405) 702-5136
E-Mail: Todd.Downham@deq.ok.gov

ERIN HATFIELD, PUBLIC INFORMATION OFFICER
Oklahoma Department of Environmental Quality
707 N. Robinson, PO Box 1677
Oklahoma City, Oklahoma 73101-1677
(405) 702-7119
E-Mail: Erin.Hatfield@deq.ok.gov

JASON T. MCKINNEY,
COMMUNITY INVOLVEMENT COORDINATOR
U.S. EPA Region 6 (6SF-VO)
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-8132
E-Mail: mckinney.jason@epa.gov

The Administrative Record file for the Wilcox Refinery site will be available for public review at these locations:

BRISTOW PUBLIC LIBRARY
111 West 7th Avenue
Bristow, Oklahoma 74010
(918) 367-6562
Mon. through Thurs. 9:00 am - 6:00 pm
Sat. 9:00 am – 1:00 pm
Closed Friday and Sunday

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY:
Central Records
707 N. Robinson – 2nd Floor
Oklahoma City, Oklahoma 73102
(405) 702-1188
E-Mail: centralrecords@deq.ok.gov
Mon. through Fri. 8:00 am – 4:30 pm

U.S. EPA REGION 6
7th Floor Library
1445 Ross Avenue, Suite 12D13
Dallas, Texas 75202-2733
(214) 665-2792 or 1-800-533-3508 (Toll Free)
Mon. through Fri. 7:30 am – 4:30 pm

ON THE INTERNET:
DEQ HOMPAGE, LAND PROTECTION DIVISION
www.deq.state.ok.us/lpdnew/index.htm
(Scroll down to Wilcox Refinery)

U.S. EPA HOMPAGE:
www.epa.gov

U.S. EPA SUPERFUND DIVISION:
www.epa.gov/superfund/search-superfund-sites-where-you-live

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Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences

CS249955-AD

Polycyclic Aromatic Hydrocarbons

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30333.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

LEAD

CAS # 7439-92-1

Division of Toxicology and Environmental Medicine ToxFAQs™ **August 2007**

This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- ❑ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ❑ When lead is released to the air, it may travel long distances before settling to the ground.
- ❑ Once lead falls onto soil, it usually sticks to soil particles.
- ❑ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- ❑ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.
- ❑ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.
- ❑ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.
- ❑ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- ❑ Avoid exposure to sources of lead.
- ❑ Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- ❑ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ❑ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ❑ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter (µg/dL). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

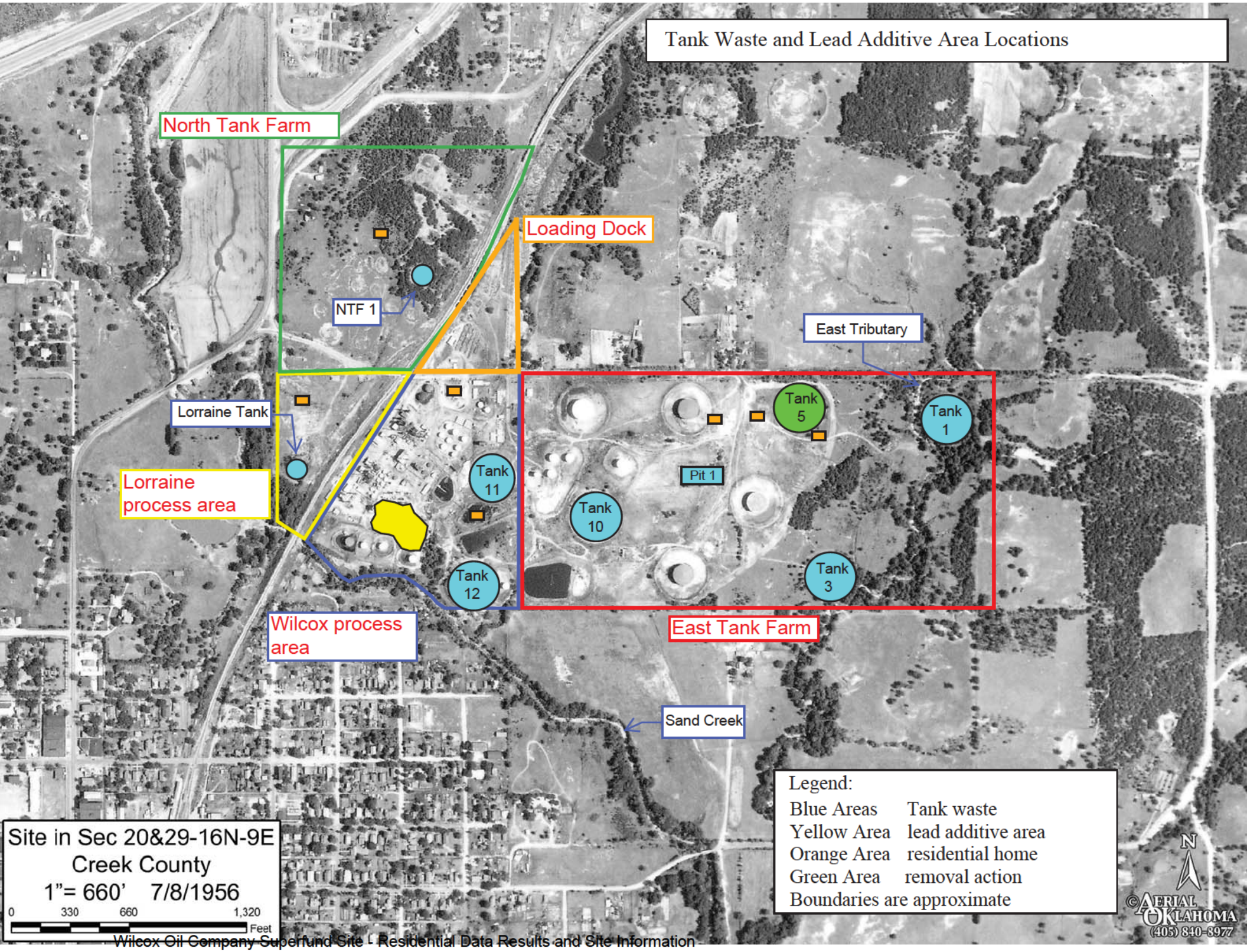
The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 µg/dL to be a level of concern for children.

EPA limits lead in drinking water to 15 µg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.


Tank Waste and Lead Additive Area Locations
North Tank Farm
Loading Dock
NTF 1
East Tributary
Lorraine Tank
Tank 5
Tank 1
Lorraine process area
Tank 11
Pit 1
Tank 10
Tank 12
Tank 3
Wilcox process area
East Tank Farm
Sand Creek
Legend:
Blue Areas Tank waste
Yellow Area lead additive area
Orange Area residential home
Green Area removal action
Boundaries are approximate
Site in Sec 20&29-16N-9E
Creek County
1"= 660' 7/8/1956
0 330 660 1,320
Feet
N
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